HELMINTHIASIS

IN THE

EGYPTIAN ARMY.

by

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C O N T E N T S.

12./

I. INTRODUCTION.

For the past few years gigantic irrigation works have been under construction in the Anglo-Egyptian Sudan, the ultimate object of which is to bring under cultivation the great wedge of 600,000 acres of waterless but fertile land lying between the confluence of the Blue and White Niles, and known as the Gezira.

Ankylostomiasis and Schistosomiasis are already endemic in the Anglo-Egyptian Sudan wherever conditions are favourable for their propagation; it is therefore reasonable to apprehend that unless special measures are taken to control their spread they will eventually convert the whole Gezira area into a hotbed for their dissemination comparable to the valley and delta of the Nile in Egypt. No doubt by the strict application of the knowledge we possess the Gezira could be kept entirely free from these diseases. But economy is a vital factor in ambitious schemes of development, and perfection in hygienic matters may easily be attained at too high a price. It would in fact be just as reprehensible to paralyze the scheme by taking too elaborate hygienic precautions as it would be to wreck it by taking none at all.

The Government of the Anglo-Egyptian Sudan will have/

have to recognize the fact that infestation of the Gezira area with parasitic worm diseases is inevitable, and therefore take steps to control the degree of infestation and thus prevent the success of the scheme being imperilled through these diseases becoming sufficiently prevalent to lower the economic efficiency of the labouring population. This end they can achieve by ensuring that the education of the people shall include instruction in the nature, mode of spread, and effects of these diseases, by organizing village conservancy and water supply on lines which will reduce to a minimum pollution of the soil and canals by human excreta, by destroying periodically, by physical and chemical means, snails, especially in the tertiary canals, and by establishing a travelling anthelminthic hospital for the purpose of examining all labourers and their families at stated intervals, and treating those found to be infested.

When construction work in the Gezira began on a large scale at Makwar and Gebel Aulia in 1920 the floating labour population of the Anglo-Egyptian Sudan numbered only some 5000 men. It became necessary therefore to import the remaining 15,000 from Egypt, a country in which the majority of the labouring population are known to suffer from one form or another of parasitic worm disease, chiefly ankylostomiasis, schistosomiasis/

schistosomiasis and ascariasis.

The Sudan Medical Department, recognizing that full economic value could not be obtained from a horde of diseased workmen, and fully alive at the same time to the danger that would be incurred by introducing them in their native state into the Gezira, decided to establish a quarantine at Wadi Halfa, the boundary town between Egypt and the Anglo-Egyptian Sudan, for the purpose of examining them all and treating those found to be infested before allowing them to enter the country. This quarantine was also designed to act as a check against the introduction of cholera, plague, small-pox, typhus, and relapsing fever. There were approximately 900 cases of plague, 8000 cases of small-pox, 10,000 cases of relapsing fever, and 20,000 cases of typhus fever in Egypt in 1919.

2. THE WADI HALFA QUARANTINE.

I was charged with the organization of this Quarantine and as the work accomplished has a considerable bearing on the subject of this Thesis, a brief description of the routine adopted and a summary of the results achieved will not be out of place here.

Twice a week batches of 450 to 750 labourers arrived at Wadi Halfa by steamer from Egypt (fig. 1). They/

They were dealt with at the rate of 150 to 250 a day in palm mat shelters and tents, till the whole 15,000 had been passed through. The staff consisted of myself, one British Laboratory Assistant, and a small band of locally enlisted Berberines.

The men were controlled throughout by means of serial numbers painted on the skin with a solution of silver nitrate which blackened on exposure to light and remained indelible for some days.

The daily routine consisted in numbering the men (fig. 2), giving them a purge of 25 gm. magnesium sulphate in 50 cc. of water at 6 p.m. (fig. 3), starving them till 6 a.m., administering 2 gm. of thymol at 6 a.m., followed by another 2 gm. at 8 a.m., disinfecting their clothing (figs. 4 and 5), medically inspecting them, including estimating of the percentage of haemoglobin in each case by the Tallquist Haemoglobinometer (fig. 6), collecting their urine for subsequent microscopical examination (fig. 7), (20% suffered from nervous ~~suppression~~ retention of urine and had to be catheterized to save time), close cropping their head hair (fig. 8), shaving their body hair (figs. 9 and 10), bathing them, vaccinating them against small pox (fig. 11), administering a second purge at midday, and collecting their faeces till 6 p.m., at which hour the batch under treatment was released to make way for the next. Urines were exam-

ined/

examined on the day of collection for the presence of ova of Schistosoma haematobium and faeces were sieved and worms recovered, on the day following collection, by a specially trained laboratory attendant, for subsequent counting and classification (figs. 12 to 15).

100% of the men were found to be lousy, harbouring commonly 1000, and in rare cases as many as 10,000 lice. As the result of the lousing routine not a single case of typhus or relapsing fever occurred amongst these men during the working season of 1920-21. This is in marked contrast to what usually occurs when Egyptian labourers are massed together, as for instance in the Labour Corps in Palestine during the war, in which louse-borne diseases were very prevalent, in spite of apparently excellent lousing arrangements. The success of the lousing routine at Wadi Halfa quarantine was largely attributable to the complete removal of the body hair which constantly harbours nits, a measure which did not form part of the lousing routine in Palestine. That the Egyptian labourers in the Sudan did not owe their immunity from louse-borne diseases to any local climatic influence is borne out by the fact that 2000 labourers from the Yemen, who were admitted to the Gezira at the same time as the Egyptians, but viâ Port Sudan, and without being subjected to a proper lousing routine, suffered so badly/

Fig.1. Labourers disembarking at Wadi Halfa.

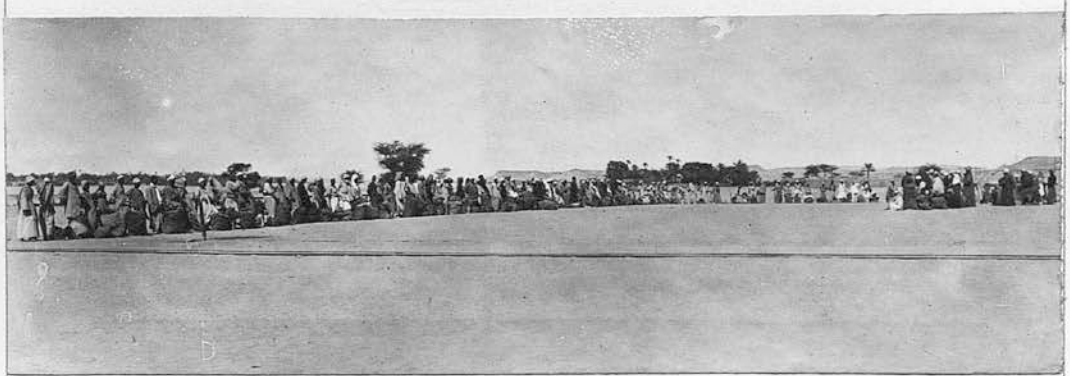


Fig. 2. Ready for numbering with silver nitrate.

Fig. 3. Administering the purge.

Fig.4. Ready for medical inspection.

Fig.5. Clothing ready for disinfection.

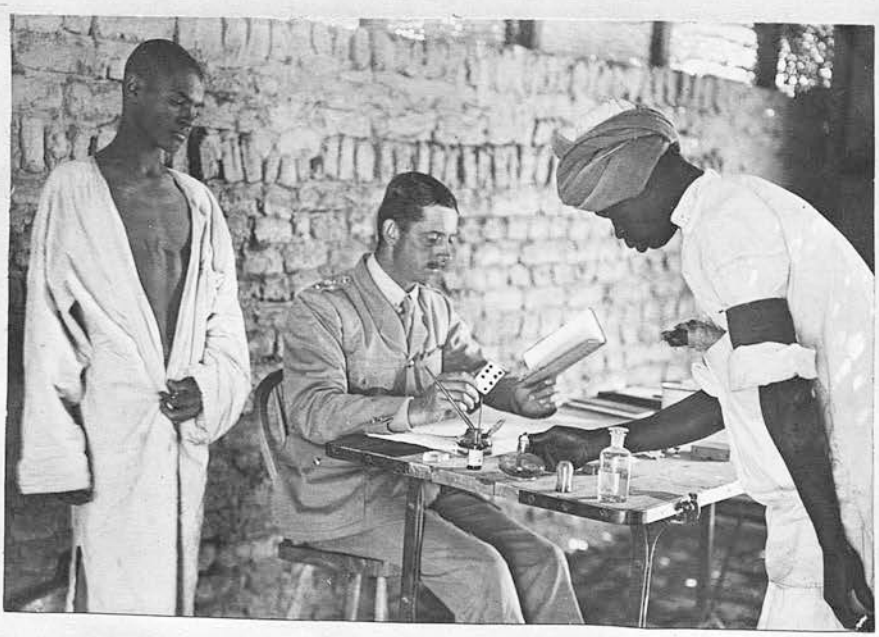


Fig.6. Medical inspection - examination for anaemia.

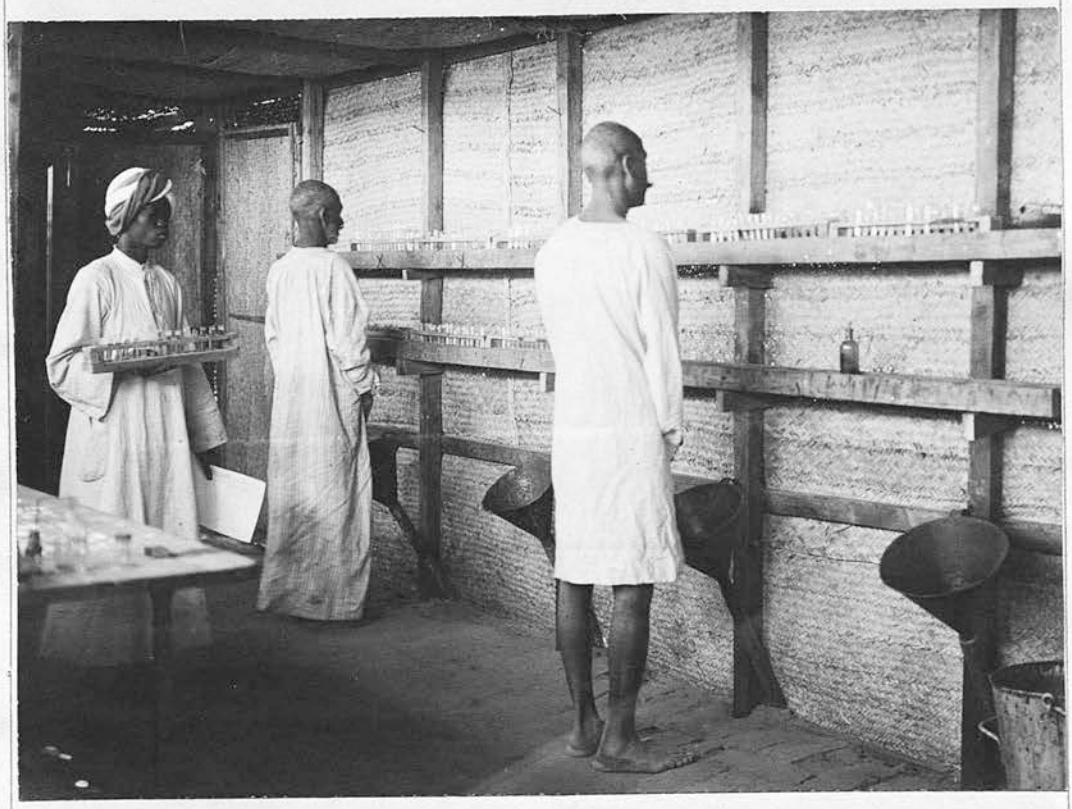


Fig.7. Collection of urine.

Fig.8. Close cropping of head hair.

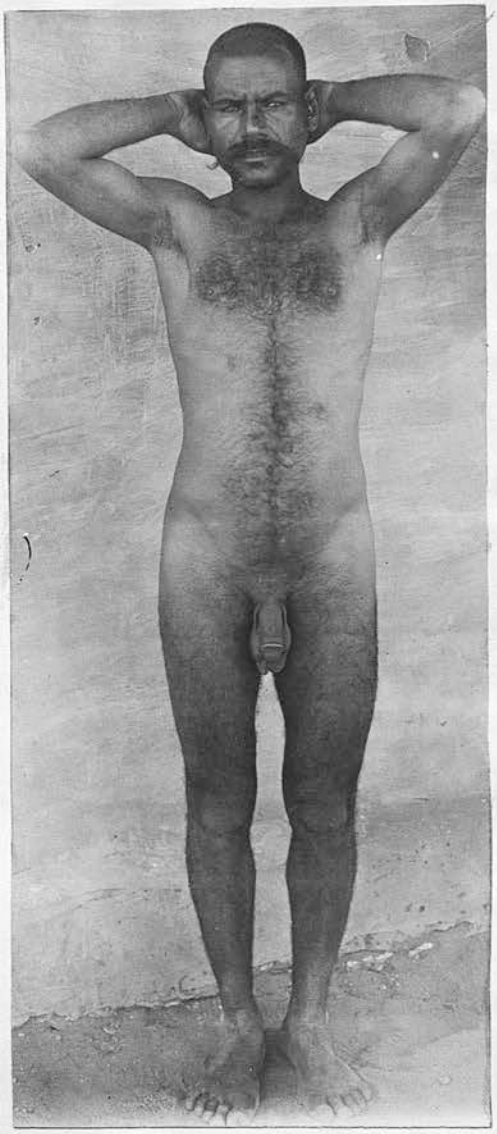


Fig.9. Before shaving.

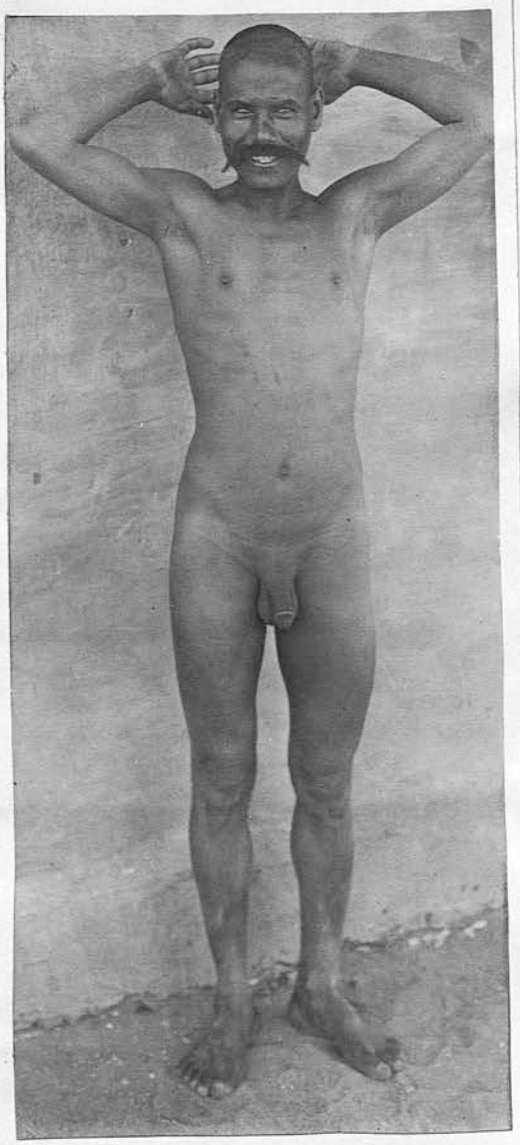


Fig.10. After shaving.

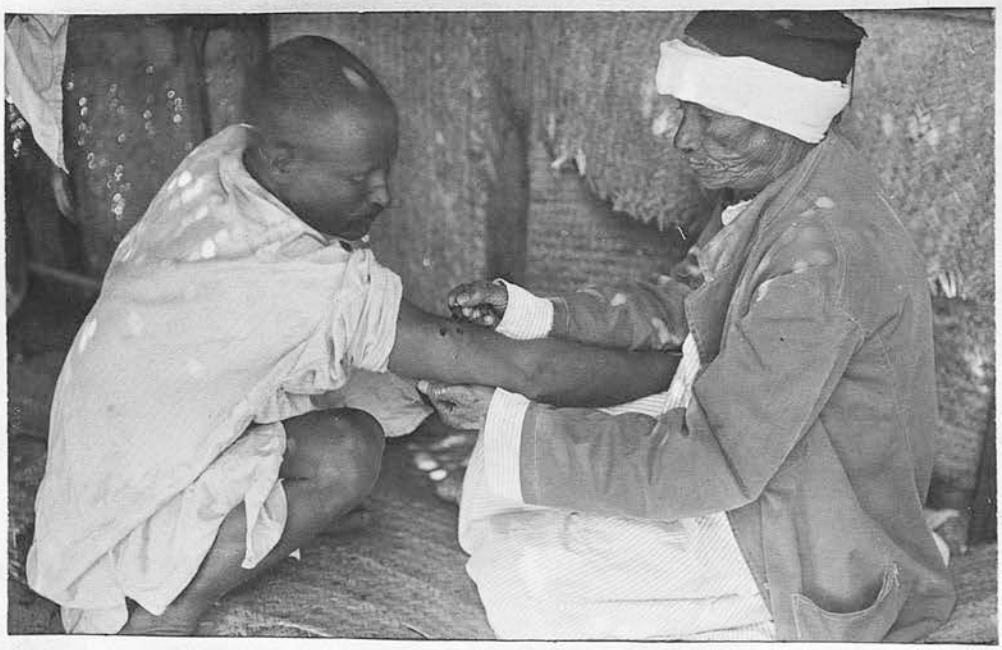


Fig.11. Vaccination against small-pox.

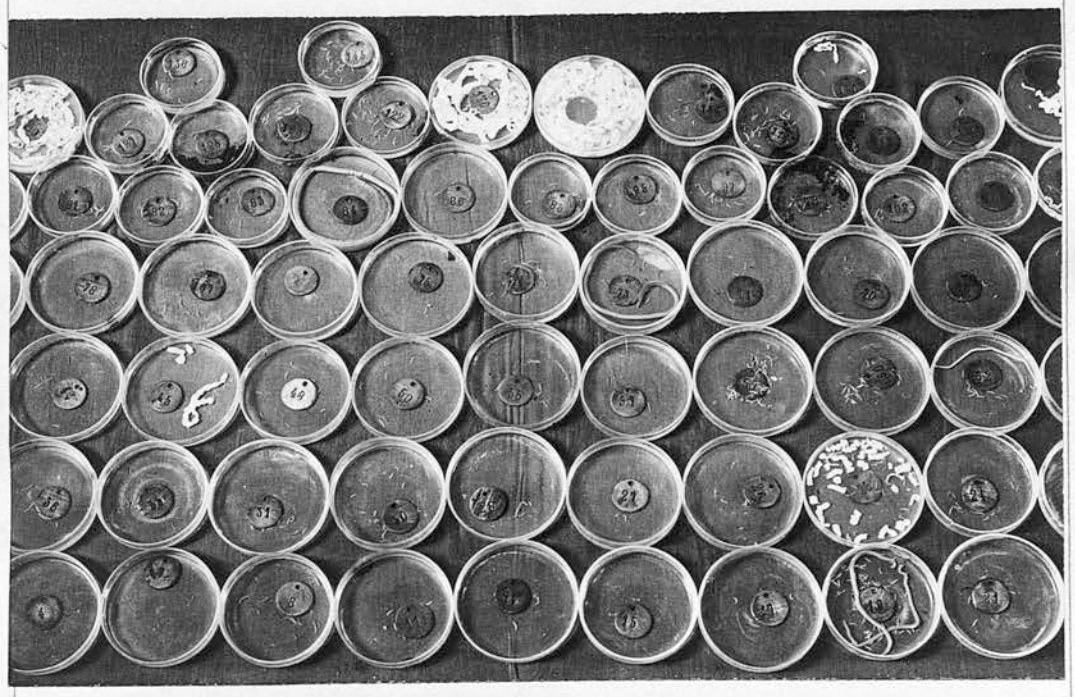


Fig.12. 75 collections of worms from 150 men.

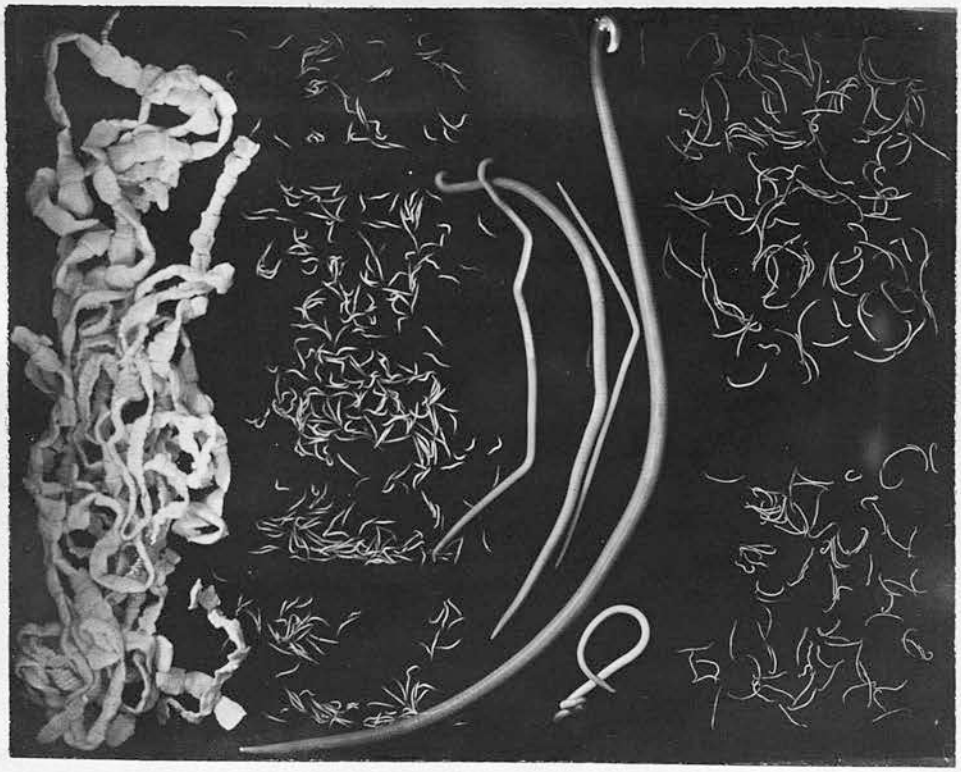
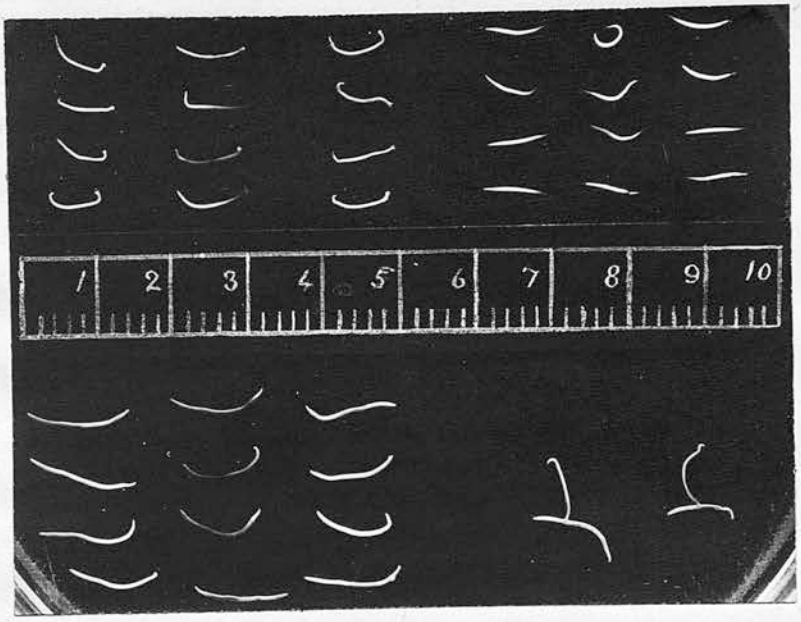


Fig.13. The same collection sorted out.

Ankylostoma duodenale♂ Oxyuris Vermicularis.



Ankylostoma duodenale♀ Copulating ankylostomes.

Fig.14. Relative size of male and female ankylostomes and oxyuris.

Fig.15. 3000 oxyuris worms from one man.

badly from relapsing fever that they had to be returned to their country.

In connection with the removal of body hair undoubtedly a certain amount of bribery used to occur. It was an easy matter for a black visaged Berberine barber with a menacing look in his eye, a large sharp razor in one hand, and a man's genitalia in the other, to ask his victim if he happened to have half a piastre about him! No doubt many were induced in this manner to compound for a comfortable shave, but it was not till one of the victims accidentally swallowed his half piastre that we discovered both the existence of the system and the method by which the money was conveyed to the barber's rooms by a naked and empty handed man!

The result of the anthelminthic work was that the sick rate of the labour force never exceeded 2%, an extremely low figure for foreigners in a bad climate. A due proportion of credit must of course be given to the Medical Department of the Sudan Government for the excellent sanitary and medical arrangements by which the men were maintained at the Gezira works in the clean and healthy state in which they were sent there.

A considerable amount of statistical evidence was collected. An examination was made of the stools of 6641 of the men who were treated with 4 gm. of thymol divided/

divided into 2 doses, and of the stools of 1447 men who were treated with 3 cc. of oil of chenopodium divided into 3 doses. The results are shown in the following table:-

TABLE 1.

	4 gm. Thymol in 2 doses.		3 cc. Oil of Chenopodium in 3 doses.	
Parasitic Worm	Carriers	%	Carriers	%
Oxyuris Vermicularis	1847	27.7	320	22.1
Ankylostoma Duodenale	1280	19.3	203	14.0
Taenia Saginata	151	2.3	24	1.7
Ascaris Lumbricoides	132	2.0	27	1.9

The figures in Table 1 do not of course indicate the true state of parasitic worm infestation either amongst these particular labourers, or amongst the general labouring population in Egypt, in the first case because only 12 hours were available for the collection of faeces after treatment and in the second case because these labourers consisted of adult males naturally selected by the fact that they felt well enough/

enough to volunteer for hard work in a bad climate.

18% were found to have schistosomiasis of the urinary bladder. I suggested that these men should be either treated or returned to Egypt, but it was decided to allow them to enter the Sudan untreated in the meantime, and to reconsider the question when the time came for letting water into the canals.

95% of the men had a normal haemoglobin count of 95% to 100%. 4% had mild anaemia with counts ranging from 75% to 90%. 1% had severe anaemia with counts of 70% or less, the lowest recorded being 45%; all in the latter category were sent back to Egypt.

It was noted in certain cases that the only obvious explanation of the presence of severe anaemia was heavy infestation with lice. This is not surprizing when one recollects that a man with 1000 lice on him, - no uncommon person in Egypt - has to suffer the injection of 5000 doses of irritating salivary juice and provide 5000 meals of blood every 24 hours. These bites result in irritation by day and sleeplessness by night; the sufferer's body becomes excoriated from head to foot, and the scratches very often become the seat of pyogenic infection. Small wonder that he becomes in time anaemic and not infrequently neurasthenic as well. The louse problem in Egypt is one which has not yet received the attention it merits, doubtless owing to the overwhelming importance of parasitic/

parasitic worm infestation.

During the organization of the Wadi Halfa quarantine the Sudan Government not unnaturally asked the Egyptian Army to second its efforts to control the importation of carriers of parasitic worms into the Sudan by examining and when necessary treating all soldiers sent to serve in the country. This request was repeated from time to time in subsequent years but did not meet with any response.

3. PARASITIC WORM INFESTATION AMONGST EGYPTIAN ARMY RECRUITS.

Returning to Khartoum in July 1923, after a tour of inspection in the Sleeping Sickness area of the Bahr el Ghazal Province, I rejoined the Egyptian Army and was posted to Cairo as Senior Medical Officer Egyptian Army troops in Egypt.

Within a month of my arrival the Sudan Government once more raised the question of infested soldiers being admitted to the Sudan. My advice having been asked I replied that although the Sudan Government was undoubtedly justified in demanding that its efforts should be backed up in every possible way, I did not consider that too much weight need be given to the potential/

potential danger from these soldiers, less than 2000 of whom normally proceed to the Sudan in any given year, especially as the great majority of them are stationed in Khartoum, Halfaia and Omdurman, where their general mode of life and sanitary surroundings preclude the possibility of their disseminating parasitic worm diseases, whilst most of the remainder are stationed in places where these diseases are either already endemic, or else cannot be spread for biological reasons. At the same time I gave it as my opinion that there existed more than sufficient grounds for tackling the whole problem from the purely military point of view, as one primarily and deeply concerning the health and efficiency of the army, and one which it appeared to be the duty of its medical service to tackle at once and in a comprehensive manner.

My reasons for expressing this opinion were that widespread infestation of a community with parasitic worm disease is known to lower its standard of health, physique, efficiency and morale, that ankylostomiasis and schistosomiasis were very prevalent in the army, as evidenced by hospital and invaliding statistics for many years past, and that these diseases were essentially curable. The arguments in favour of their eradication appeared therefore to be overwhelming.

The strength of the Egyptian Army is maintained by/

by conscription from a population the majority of whom are known to suffer from parasitic worm infestation. Every year about 90,000 youths in Egypt reach the age of 19 and become liable to be called up for military service. Recruiting Commissions which tour the provinces weed out about 80,000 of these. A man may claim exemption on the grounds that he is the bread-winner of a family, that he is the only son of his father, or that he is the eldest son of a divorced mother, or he may buy exemption by the payment of £eg. 20, but the great majority are rejected on sight as medically unfit, a terrible commentary on the prevailing state of health of the masses in Egypt. Should more than 10,000 be available after this preliminary examination, the required number are selected by ballot, and sent into Cairo when they reach the age of 21, for final medical examination. Another 6000 of these obtain exemption for one or other of the reasons stated above, the great majority again because they are medically unfit. Thus about 4000 are finally taken, that is to say about 4% of those who were originally available, a figure which yields a high standard of physique, though not of health, as already indicated.

The routine method by which sufferers from parasitic worm infestation were supposed to be eliminated/

eliminated at the final medical examination merits description only as a typical example of a measure, unsound in conception, proved to be valueless in practice, yet so hallowed by custom as to have been blindly and thoughtlessly followed ever since. As the examining medical officer passed through the gates of the hospital grounds he encountered a row of huddled figures cowering under blankets for protection from the keen morning air. A sharp word of command rang out and 75 dazed fellahin (peasants) rose to their feet, each one bearing in his hand "Pots, chamber, iron enamelled, one". On the word "Shokh" they micturated in unison and with a degree of precision remarkable considering their total unfamiliarity with either chamber pots or military discipline. On the word "Mphokh" each wondering fellah blew aside the froth on his respective pot whilst an immaculate senior medical officer, hiding his bursting feelings as best he might under a martial exterior, passed along the line scanning the contents of each in turn with eagle eye for pus, or clots, or gouts of blood.

It may here be fittingly recorded that senior medical officers were long victimized by a wily ex-shawish (sergeant) of the Medical Corps, who built up a lucrative "practice" by injecting blood-stained urine into the bladders of conscripts the night before the/

the final medical examination! Detection came, and was followed by swift retribution, when an unfortunate "patient", seized with an urgent desire to micturate during a cold night, and unwilling to lose the benefit of his investment, tied a cord so tightly round his penis that his bladder burst before dawn and his gangrenous organ had to be amputated shortly after! The "doctor" and his confederates are still "doing time".

For the detection of the less common but much more serious disease, schistosomiasis of the rectum, no test was applied at all.

The only test applied for the detection of ankylostomiasis was a naked eye estimation of the degree of anaemia present.

An examination of the statistics of the Egyptian Army General Hospital, Cairo, for 1923 clearly demonstrates the inadequacy of the tests applied for Schistosomiasis of the urinary bladder and ankylostomiasis, and also brings out the vital necessity for a test for schistosomiasis of the rectum. Thus during 1923 no less than 14% of the men treated in that hospital were admitted primarily for parasitic worm diseases, whilst of 253 men found unfit for further service during the same period, 73, or 29% were invalided for the same cause, the majority for schistosomiasis of the rectum. In addition to this a large proportion/

proportion of "fit" men are known to suffer constantly from anaemia, debility, palpitation, arrhythmia, epigastric discomfort, dysuria, haematuria, passage of blood in the stools, and other signs and symptoms of parasitic worm disease, without feeling ill enough to seek hospital treatment.

Now it has long been a matter of common knowledge that the Egyptian fellah, removed from his native country and mode of life, and sent to serve as a soldier in the Sudan, succumbs all to readily to the vicissitudes of service in a climate which, even in perfect health, he is after all little more fitted to withstand than the European soldier. This failing has been commonly attributed in the past, by medical as well as by combatant officers, to an inherent and inexplicable defect in the constitution and character of the Egyptian peasant. The statistics quoted above afford the strongest possible evidence for believing that the undisputed lack of resistance to hardship of the Egyptian soldier, far from being an inherent defect is really an acquired one, due to chronic infestation with parasitic worms. In any case until the part played by parasitic worm disease in undermining the constitutions of Egyptian soldiers has been properly investigated it would be wiser to refrain from imputing to nature what is much more probably due to neglect.

Convinced/

Convinced by a survey of the situation that immediate action was called for, I introduced on my own responsibility proper measures for the mass diagnosis of worm diseases amongst recruits at the final medical examination, and made suitable arrangements for treating those found to be infested before allowing them to join their units.

A wordy correspondence ensued.

4. DISPOSAL OF ARGUMENTS AGAINST THE NEED FOR AN ANTHELMINTHIC CAMPAIGN IN THE EGYPTIAN ARMY.

Both at this juncture and subsequently numerous arguments were advanced against the necessity for an organized scientific campaign to eradicate parasitic worm infestation from the Egyptian Army. These arguments were calculated to impress the lay mind and as they seemed likely,if supported,to prevent the introduction of a measure designed solely in the first instance for the improvement of the health of the private soldier, it became necessary to expose them in terms which would admit of no misunderstanding.

It was alleged that parasitic worm diseases had always been dealt with in the Egyptian Army. To this I replied that there was a fundamental difference between/

between (a) neglecting to treat the worm infested individuals in the Army till some of them had become so ill as to require hospital treatment, or even invaliding, and (b) searching out and treating all the worm infested individuals in the Army before any of them had become ill at all. The former method was palliative only and, in light of modern knowledge, supine; it had had a fair trial in the Egyptian Army for many years, in which it had proved a lamentable failure, as it had in every other worm infested community in the world. The latter method, that of the anthelminthic campaign, was radical, and had proved successful wherever its principles had been applied. It was the method which should have been adopted many years ago in the Egyptian Army in regard to ankylostomiasis and ascariasis, and at least six years ago in regard to schistosomiasis.

It was alleged that the tests already described for these diseases had given satisfactory results in the past, an assertion which was shown to be entirely unwarranted by quoting the official statistics of the Egyptian Army General Hospital, Cairo, for 1923.

It was alleged that many men got rid of their infestation by natural means in the course of 5 years service. To this I replied by stating that the whole weight of army statistical evidence was against any such/

such assumption, unsupported as it was by a single observation in Egypt or the Sudan that would bear the light of day in a scientific publication. The real truth was that far from army service enabling infested men to throw off their infestation it was directly responsible for large numbers of men who appeared on superficial inspection to be perfectly fit on enlistment, breaking down all too readily under the vicissitudes of service in a bad climate. I did not of course deny that a small proportion of ankylostomes and a smaller porportion of schistosomes might and probably did die off in the course of 5 years service, but I pointed out that in view of the span of life of the worms, the number of men who could become cured in this way must be so extremely small as to be negligible. I further pointed out that as long as large numbers of men were being treated in hospital and invalided the difference, if any, in the percentage of infestation amongst recruits and serving soldiers must be ascribed to these causes, in default of direct scientific evidence in favour of the natural cure theory. Finally, even if natural cure were proved to be a factor in the case, it appeared to be in the highest degree unenterprising to wait 5 years for nature to accomplish what science could do in as many hours or weeks. Finally it was alleged that the whole question was one for the Public Health Department of Egypt, rather/

rather than for the Army, a counsel of perfection which revealed a total failure to appreciate the gigantic nature of the problem before that Department, of the number of years likely to be occupied in solving it, and of the huge expenditure certain to be involved in its solution. I pointed out that the problem of the Army was, in comparison to that of the country as a whole, a relatively urgent one, capable of immediate and complete solution at a cost which would be infinitesimal compared to the benefits that would certainly ensue. Furthermore as the Medical Corps had entire control of every phase of medical and sanitary work concerning the Army, it appeared to be absolutely unjustifiable to dismiss this particular problem by laying the onus of its solution on the Public Health Department, especially as it was quite obvious that this procedure could not possibly result in any improvement for years to come.

I had not expected to encounter arguments of this sort. My chief fear had been that objections would be lodged against the scheme on the grounds of military expediency, owing to the fact that treatment, especially for schistosomiasis, would involve detention of recruits with consequent delay in their training. This fear proved groundless. The Inspector General of Egyptian Army troops in Egypt, El Lewa C.W. Spinks Pasha/

Pasha, C.B.E., D.S.O., at once grasped the essential features of the problem. He considered that any attempt to improve the existing state of affairs, even if it should end in failure, was worthy of a trial. Recognizing that the slight temporary military inconvenience involved was negligible compared to the ultimate benefits likely to accrue, he helped to further the scheme in every possible way. This attitude was reflected by all the Egyptian Officers commanding units serving in Egypt who were only too well aware of the part played by parasitic worm diseases in sapping the vitality and efficiency of their men.

5. ORGANIZATION OF ROUTINE MEASURES FOR MASS DIAGNOSIS OF ANKYLOSTOMIASIS AMONGST EGYPTIAN ARMY RECRUITS.

The Adjutant General of the Egyptian Army, El Lewa H.J. Huddleston Pasha, C.M.G., D.S.O., having given provisional approval to the scheme, I proceeded to establish contact with the Public Health Department. Interviews with Dr Charles Todd, Director of the Laboratories, and with Dr Mahommed Khalil, Lecturer in Helminthology at the School of Medicine, Cairo, were followed by visits to the Anthelminthic Annexes at Kasr el Aini Hospital and Qualioub, at both of which/

which places I was immensely impressed by the scientific thoroughness with which hundreds of cases of ankylostomiasis and schistosomiasis were being diagnosed and treated every day.

The necessary apparatus was purchased (at my own risk, a request for a credit of £eg·50 having been refused) and a small supply of Carbon Tetrachloride borrowed from the Public Health Department.

These preparations having been made, I proposed as a preliminary experiment to get to work on a batch of about 300 recruits for the Police School Abbassia. These are conscripted by the Recruiting Department at the same time and under exactly the same conditions as recruits for the Army. But here I met with an unexpected check owing to the attitude of the Commandant of the Police School who objected to having his men tampered with in this way! As he was not under military discipline I had to apply for support to the Ministry of the Interior, only to find the Commandant had preceded me by 2 hours, and left again armed with covering authority for his attitude. I asked for an interview with Abd el Razik Pasha, the Under Secretary of State for the Interior, a courtly and intelligent Egyptian gentleman, whom I bombarded with the statistics and photographs which appear in the earlier part of this report. Whether his conversion was the result of conviction or the outcome of a desire for peace/

peace is neither here nor there. At any rate I left at the end of half an hour armed with a counter order which completely smoothed away all further difficulties.

The recruits for the Police School were sent by the Recruiting Department to the Egyptian Army Hospital at the rate of 70 a day. From this number about 50 were selected who had every superficial appearance of perfect health. They were then sent back to the Recruiting Department, where a few would make good their claims to exemption on grounds not connected with their health. The balance, perhaps 45, after being detailed to their units, were returned to the Hospital where they were passed through the newly organized anthelminthic annexe.

On entering the annexe each man was given a serial number for the day which, together with his name, unit and province, was entered on a form espe-ially printed for the purpose (fig. 16).

The faeces of each recruit was collected in a numbered chamber pot. A teaspoonful, approximately 3 gm., was removed by an orderly and emulsified thoroughly in a saturated solution of ordinary sodium chloride contained in a 60 cc. porcelain ointment pot. This emulsion was filtered through a double layer of gauze into a small Erlenmeyer flask of 80 cc. to 100 cc. capacity, which was then filled to the neck with/

Examination of Recruits who have been found fit for service in the E.A. relative to their infestation with Helminths.

فحص أنفار القرعة المستجدين الذين وجدوا لائقين للخدمة العسكرية بالجيش المصرى فيما يختص باصابتهم بالديدان

W.O.P., Cairo 500. 1-'23

Daily number of Recruits examined يومية مسلسلة بعدد المستجدين	Number of Recruit in daily series عدد مسلسل يومية	Rank & Name رتبة واسم	Unit سلاح	Home: Lower or upper Eg. من بحرى أو من قبلى	Blood دم: مقدار الهيموجلوبين بالمائة c/o Haemog.	Found in the Urine الموجود بالبول: Blood دم	Pus صديد	Bilharzia بلهارسيا	Found in the faeces الموجود بالغائط: Blood دم	Mucus مخاط	Bilharzia بلهارسيا	Ankylostoma انكيلوستوما	Ascaris اسكاريس	Trichuris دودة وجيدة	Oxyuris أوكسيورس	other worms ديدان أخرى	Serial Number for ANK. نمرة مسلسلة بالانكيلوستوما	Remarks. ملحوظات

Signature
الامضاء
M.O. i/c Anti-Helminthic Annexe.
الضابط الحكيم المخصص لفرع معالجة الديدان

E.A. Gen. Hospital
الاسبتالية العمومية للجيش المصرى
Cairo — — — 192...
مصرفى ١٩٢

fig. 16

with saturated solution of sodium chloride (fig. 17). In a few minutes all ankylostoma ova float to the top of such a solution, so by the time the last of the series of emulsions had been prepared the first was ready for examination. With a stout wire loop the top layer of the emulsion was removed and placed on a slide, three or four dips serving to remove the whole of it, and with it practically all the ankylostoma ova in the original 3 gm. of faeces. A proportion of ascaris, taenia, and schistosoma ova are also floated by this method. The findings were noted in the appropriate columns of the special form. Lastly a yellow index card was prepared for each patient (fig. 18).

The results of this examination which are shown in Table 2 confirmed my worst suspicions.

TABLE 2.

Number of Recruits examined -	292
Number of Recruits found to harbour parasites	265
Percentage " " " " "	91

Nature of Infestation	Number infested	Percentage infested.
Ankylostomiasis	212	73
Schistosomiasis	152	52
Ascariasis	20	7
Other infestations	9	3

Fig.17. Apparatus for examination of faeces.

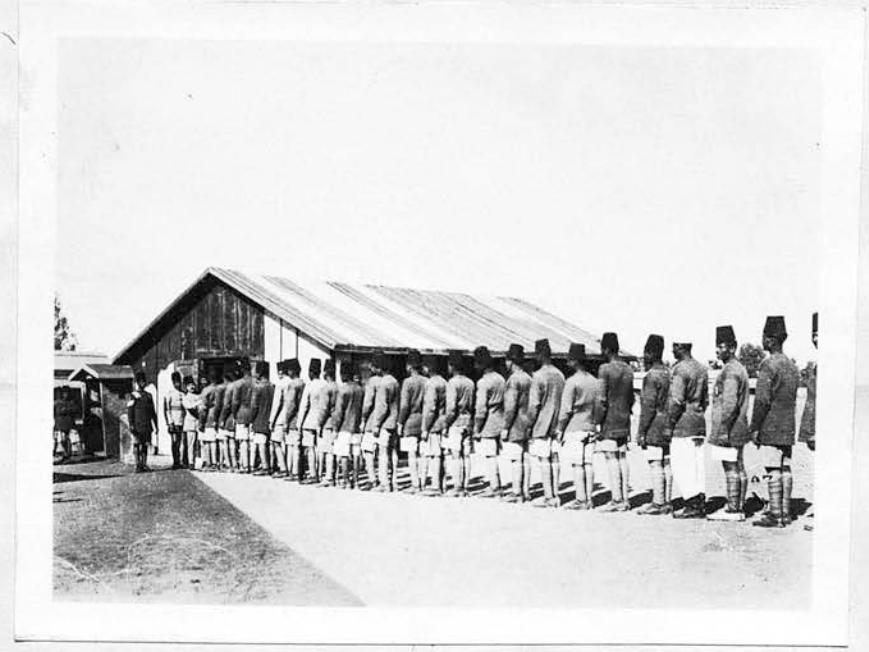


Fig.19. Administering carbon tetrachloride.

Ankylostoma

انكيلوستوما

Serial No.

نمرة متسلسلة .....

No. — Rank — Name — Unit

نمرة ..... رتبة ..... اسم ..... سلاح .....

Date of Exam.

تاريخ الفحص .....

Blood

الدم : —

Haemoglobine — %

الهيموجلوبين ..... ٪ بالمائة

Faeces

البراز : —

Eggs — بيض

Ankylost. — انكيلوستوما

Ascaris — اسكاريس

Taenia — الدودة الوحيدة

Oxyuris — اوكسيورس

other worms — ديدان اخرى

Fig. 18

1st treatment
المعالجة الاولى

Date التاريخ	Medicine الدواء	Dose الجرعة	Remarks ملحوظات

Result of Exam. of Faeces
نتيجة فحص البراز
after treatment
(١) بعد نهاية العلاج .....
3 months after treatment
(٢) ثلاثة أشهر بعد العلاج .....

2nd treatment.
المعالجة الثانية

Date التاريخ	Medicine الدواء	Dose الجرعة	Remarks ملحوظات

Result of Exam. of Faeces
نتيجة فحص البراز
after treatment
(١) بعد نهاية العلاج .....
3 months after treatment
(٢) ثلاثة أشهر بعد العلاج .....

6. THE TREATMENT OF ANKYLOSTOMIASIS WITH CARBON TETRACHLORIDE.

It was decided to treat the 212 police school recruits who harboured intestinal parasites with 5 cc. carbon tetrachloride, given plain by the mouth, immediately after diagnosis without the administration of a preliminary purge, but on a naturally empty stomach, that is to say before the morning meal. (figs. 19 and 20). A purge of 25 gm. of magnesium sulphate in 50 cc. of water was given 2 hours after the administration of the carbon tetrachloride.

The after effects were strikingly mild. The majority of the men experienced no symptoms whatsoever, whilst the minority complained only of slight epigastric discomfort, dizziness, and in a few cases, nausea. One man only said he felt very sick but even he did not vomit. (fig. 21) The men with symptoms were separated from the men with none, and in a short time it was noticed that the former were all lying down and silent (fig. 22), whilst the latter continued to sit up and joke and chat with their comrades (fig. 23).

These men were carefully re-examined three months later. 79% were found to have been completely cured, whilst the condition of the remainder had so greatly improved that 3 gm. of faeces would only yield an occasional/

Fig.20. Swallowing the dose.

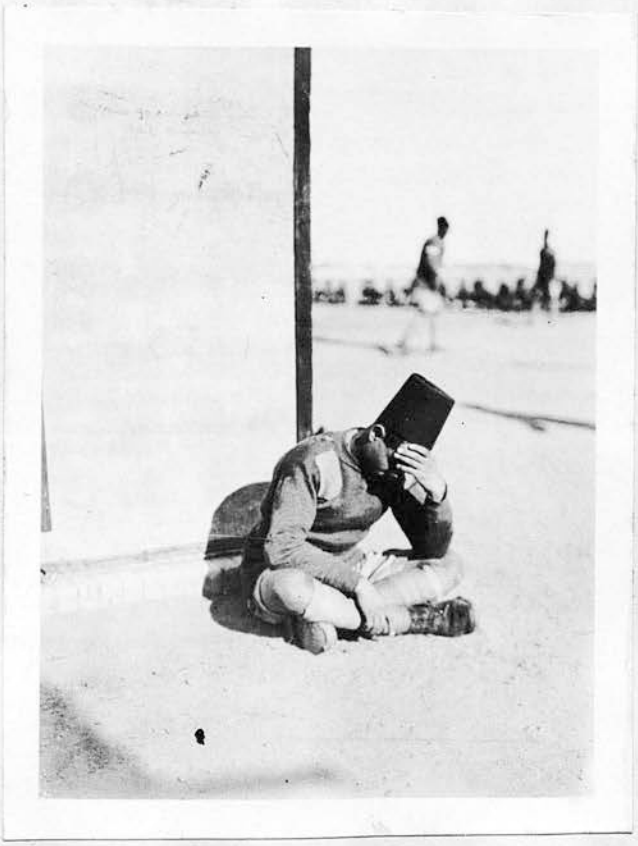


Fig.21. Feeling the after effects.

occasional ovum after prolonged search in cases in which the same quantity of faeces before treatment had yielded field after field packed with ova.

At Wadi Holfa Quarantine in 1920 I treated 12,500 men with 4 gm. of thymol and 1500 men with 3 cc. of chenopodium oil, and I can safely say that for efficacy, ease of administration, mildness of after effects, safety, and cheapness, carbon tetrachloride is incomparably the best anthelminthic yet discovered for the mass treatment of ankylostomiasis amongst Egyptians.

7. DISPOSAL OF ARGUMENTS ADVANCED AGAINST THE USE OF CARBON TETRACHLORIDE.

In the course of this and subsequent work certain arguments were advanced against the use of carbon tetrachloride which it will be convenient to dispose of now.

On the strength of an unrecorded experiment, conducted by a predecessor of mine with one litre of the medicine, it was alleged that it would only cure 1% of cases! I pointed out that the Public Health Department of Egypt had treated 6000 cases with it at Qualioub Anthelminthic Annexe in 1923, and had got 76% of cures. I also quoted my own carefully con-

trolled/

controlled experiment, which fully confirmed their finding.

It was also alleged that carbon tetrachloride was a dangerous medicine about which we ought to know more before using it on a large scale. To this I replied that the effects of carbon tetrachloride were mild and evanescent in the extreme compared to those following the administration of thymol and chenopodium oil, and that such cases of poisoning as had been recorded took place in the early days, and had long since been proved to be due to the effects of carbon bisulphide, a very poisonous impurity present in commercial carbon tetrachloride. I also pointed out that experiments conducted in the Public Health Laboratories in Egypt had shown that a dog could without injury take a dose of 8 cc. per kilogram of body weight, which is equivalent to a dose 100 times larger than that actually administered to human beings in practice. Its harmlessness was further vouched for by the fact that as the result of the human and animal experiments conducted by the Public Health Department of Egypt the medicine was now being used in the 4 anthelminthic annexes, all the government hospitals, and most of the private hospitals in Egypt.

An extraordinary argument advanced, presumably as a reason for not treating the sufferers at all, was that a better medicine might be found! To this I replied/

replied that if a better medicine were discovered it would doubtless be substituted for carbon tetrachloride, but the underlying principles of mass diagnosis and treatment with the best medicine available would always remain the same.

8. ORGANIZATION OF ROUTINE MEASURES FOR MASS DIAGNOSIS OF SCHISTOSOMIASIS AMONGST EGYPTIAN ARMY RECRUITS.

The urines of recruits were collected in conical glasses bearing their respective numbers (fig. 24). A special form of glass with a rounded bottom was used, (fig. 25A), the ordinary type with a pointed bottom (fig. 25B) being unsuitable on account of the difficulty of getting at the ova except with the use of a very fine pointed pipette which is easily broken. As the collection of urine was the first item on the day's agenda and its examination the last, the process of sedimentation was always complete in plenty of time. Sedimentation of the whole urine naturally yields a higher percentage of positive results than centrifugalization of a portion of it, so where time is no object it is the better method. The glasses must of course be kept scrupulously clean, and should be/

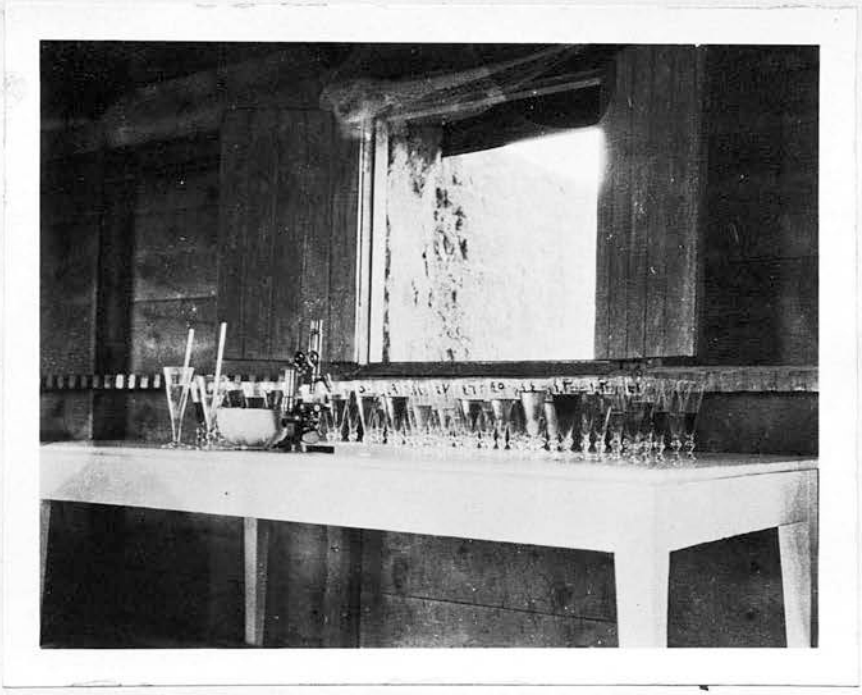


Fig.24. Urines ready for examination.

Fig.25. Urine glasses.

B = the wrong type. A = the right type.

be stored bottom up when empty, and kept covered when full, so as to exclude dust.

After allowing time for blood, pus, and ova to settle, one or two drops were transferred by pipette from the bottom of the glass to a slide, and examined under the low power without a coverslip. The presence of blood, pus, or ova was noted in the appropriate column of the special form (fig. 16) these data being entered subsequently on an index card.

9. THE TREATMENT OF SCHISTOSOMIASIS WITH ANTOMONY SODIUM TARTARATE.

I decided to treat schistosomiasis with antimony sodium tartarate. The required quantity of a 6% solution (1 gr. to 1 cc.) was prepared and sterilized each day for use the following day.

The course consisted of twelve intravenous injections given on alternate days, Fridays excepted. The first dose was half a grain, the second one grain, the third one grain and a half, and the fourth and subsequent doses two grains each, making twenty-one grains in all, thus:-

First/

First treatment
المعالجة الاولى

Date التاريخ	Medicine الدواء	dose المقدار	Remarks ملحوظات

Result of Exam. of Urine & Eggs
نتيجة فحص البول والبيض

(١) بعد نهاية العلاج after treatment .....

(٢) ثلاثة أشهر بعد العلاج 3 months after treatment .....

2nd treatment
المعالجة الثانية

Date التاريخ	Medicine الدواء	dose المقدار	Remarks ملحوظات

Result of Exam. of Urine & Eggs
نتيجة فحص البول والبيض

(١) بعد نهاية العلاج after treatment .....

(٢) ثلاثة أشهر بعد العلاج three months after treatment .....

fig. 26

بلهارسيا

نمرة متسلسلة .....

نمرة..... رتبة..... اسم..... سلاح.....

تاريخ الفحص .....

مقدار الهيموجلوبين بالمائة

البول : —

دم .....

صديد .....

بيض .....

ملحوظات

البراز : —

دم .....

مخاط .....

بيض .....

ملحوظات

---

ace t

Fig. 27

Bilharzia

بلهارسيا

Serial Number
نمرة متسلسلة .....

Unit
سلاح .....

Name
اسم .....

Rank
رتبة .....

No.
نمرة .....

Date of Examination
تاريخ الفحص .....

Percent. of Haemoglobine
مقدار الهيموجلوبين بالمائة

Urine
البول : —

Blood
دم .....

Pus
صديد .....

Eggs
بيض .....

Remarks.
ملحوظات

Feces
البراز : —

Blood
دم .....

Mucus
مخاط .....

Eggs.
بيض .....

Remarks.
ملحوظات

Fig. 26

المعالجة الاولى

التاريخ	الدواء	المقدار	ملحوظات

نتيجة فحص البول والبيض

(١) بعد نهاية العلاج .....

(٢) ثلاثة أشهر بعد العلاج..... .....

المعالجة الثانية

التاريخ	الدواء	المقدار	ملحوظات

نتيجة فحص البول والبيض

(١) بعد نهاية العلاج .....

(٢) ثلاثة أشهر بعد العلاج .....

	First injection	Second injection	Third injection
First week	0.5 cc.	1.0 cc.	1.5 cc.
Second week	2.0 cc.	2.0 cc.	2.0 cc.
Third week	2.0 cc.	2.0 cc.	2.0 cc.
Fourth week	2.0 cc.	2.0 cc.	2.0 cc. Total = 21 grains

Each Recruit under treatment was given a red or a blue index card for convenience in checking attendance, those with red cards attending on Saturdays, Mondays, and Wednesdays, and those with blue cards on Sundays, Tuesdays, and Thursdays (fig. 26 and 27).

Recruits attending for treatment were first checked and lined up. Each man in turn then sat on a chair and placed his bared arm on a table which was high enough to support it fully extended from the shoulder (fig. 28). With a sterile swab an assistant swabbed the area at the bend of the elbow with spirit and compressed the upper arm till the veins stood out. The relative position of patient, medical officer, assistants, and apparatus is shown in fig. 29.
A second assistant passed a sterile all-glass 2 cc. syringe to the medical officer who filled it to the required mark with the solution, injected the contents into a vein, and replaced the syringe in a tray of tepid water. The assistant transferred it to a tray of hot water, and thence to the sterilizer, a pre-

caution/

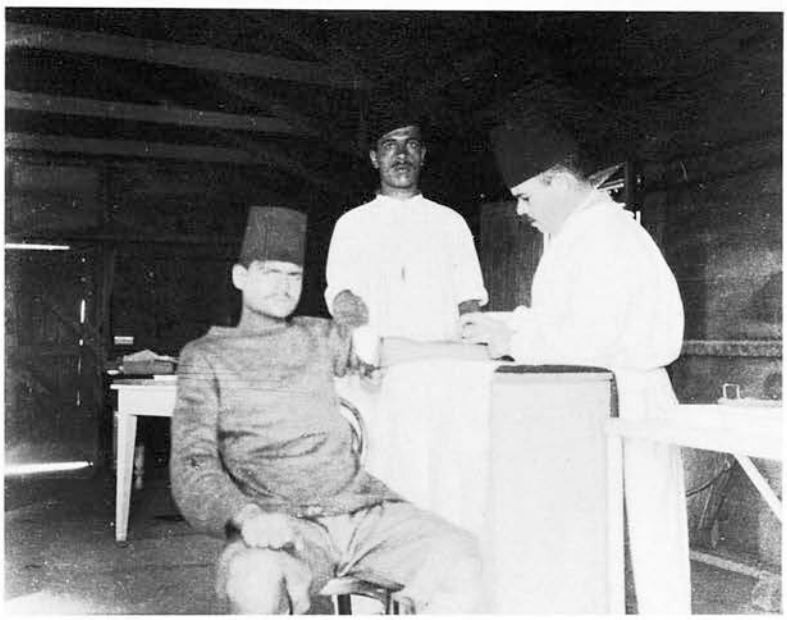


Fig.28. Intravenous injection of antimony sodium tartarate.

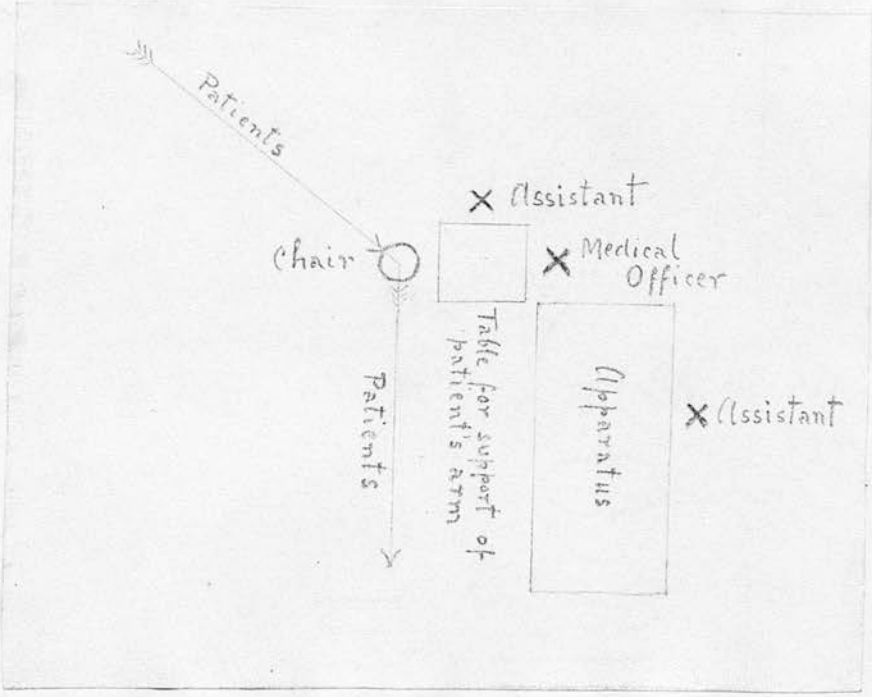


Fig.29. Relative position of patient, doctor, assistants and apparatus.

precaution necessary to prevent undue breakage of syringes. Ten syringes kept circulating in this manner served to keep the medical officer fully supplied. The lay out of apparatus is shown in fig. 30.

Careful attention to every detail of organization is essential for rapid and efficient mass treatment. The success of the arrangements described above was borne out by the fact that they enabled the medical officer to give two to three hundred intravenous injections a day at the rate of one hundred an hour.

Provided that due care is given to aseptic technique, the chief danger to be apprehended is from the escape of solution into the tissues, an accident which causes immediate burning pain at the site of injection, and frequently results in the formation of an abscess. If steel needles are used and sharpened daily, such accidents need never occur as is shown by the fact that between 1st October 1923 and 31st January 1924, 7215 intravenous injections of antimony sodium tartarate were given in this newly organized annexe without the occurrence of a single abscess.

Recruits were made to lie down for two hours after receiving their injection and were not given any drill or physical training on that day. Some experienced no symptoms whilst others complained of a transient feeling of constriction in the chest and a desire to cough,/

Fig.30. Apparatus for intravenous injections.

cough, very slight in most cases. Persistent giddiness, repeated vomiting, pain and diarrhoea, the signs and symptoms of poisoning, were never observed. Recruits were instructed in drill and physical training on the days on which they did not receive an injection.

132 of the treated men were available for re-examination six weeks, and again three months after all treatment had ceased. The results are shown in the following table:-

TABLE 3.

Number of Recruits treated for Schistosomiasis : 132

	6 weeks after cessation of treatment.		3 months after cessation of treatment.	
Findings	No. of Recruits	Percentage.	No. of Recruits	Percentage.
Living ova	15	11%	7	5%
No ova, or dead ova, or blood only.	117	89%	125	95%

The criterion of the death of the worms is failure to find ova in spite of careful and repeated examination after a sufficient interval of time has been allowed to elapse in order to give female worms weakened, but not killed by the treatment, a chance to resume/

resume the egg laying function, by which their presence in the veins of the portal circulation is detected. From Table 3 it would appear that in the great majority of comparatively mild cases of schistosomiasis 100% of the worms are killed by the course of treatment described. If, in spite of the fact that careful search after a sufficient interval reveals no living or dead ova, blood still continues to be passed in microscopic or macroscopic quantities in the faeces or urine, the probability is that it is due to a chronic ulcer, a polypus, or a calculus. The rise in the percentage of cures between the 6th and 12th weeks shown in Table 3 is probably due to the natural death of worms poisoned but not killed outright by the treatment.

There is every reason to believe that by amplifying the course of treatment described, 100% of cures could be obtained amongst recruits. It is quite clear that cure depends upon finding the limit of saturation with antimony sodium tartarate which the patient can tolerate, and maintaining it till all the worms have been killed. I would suggest the following course of 6% solution of antimony sodium tartarate as likely to secure this end in the case of comparatively healthy young adult males:

1st week/

1st week	1.0 cc.	1.5 cc.	2.0 cc.
2nd week	2.0 cc.	2.0 cc.	2.0 cc.
3rd week	2.0 cc.	2.0 cc.	2.0 cc.
4th week (a) if living ova are no longer present			
	2.0 cc.	2.0 cc.	2.0 cc. Total 22.5 grs.
(b) if living ova are still present			
	2.5 cc.	3.0 cc.	3.0 cc. Total 25 grs.

Each cc. contains 1 grain of antimony sodium tartarate.

The improvement in the health of the recruits was so dramatic that within 6 weeks the entire permanent staff of non-commissioned officers and men of the Police School asked to be examined and if necessary treated! Even more satisfactory was the opinion of The Commandant, El Kaimakam Ali Bey Zeitoun, who stated that he had never before seen any batch of recruits remain so fit under training and benefit so rapidly from it. This expression of opinion was all the more gratifying in that it came from an officer who, it will be remembered, was originally entirely opposed to the scheme. He became such an ardent propagandist that news of the work eventually reached the ear of His Excellency Mahmud Pasha Azmi, Minister of War and Marine, and finally of His Majesty King Fuad the First of Egypt who, ever solicitous of the welfare of his troops, gave immediate orders for the rank and file of the Bodyguard to be examined and treated forthwith.

10. DISPOSAL OF ARGUMENTS ADVANCED AGAINST THE USE OF ANTIMONY SODIUM TARTARATE.

In the course of this and subsequent work many arguments were advanced against the use of antimony sodium tartarate in the manner recommended by me. These it will be convenient to dispose of now.

In the first place it would be as well to explain that antimony sodium tartarate, being more soluble and less toxic than antimony potassium tartarate (Tartar Emetic), has now largely replaced that salt for the treatment of Schistosomiasis in Egypt. Possibly the lithium salt will eventually be found to be more suitable than either. Emetine is also extensively and successfully used for the treatment of schistosomiasis, sometimes alone and sometimes in combination with antimony salts; it is much more toxic than either of the latter. It owes its reputation in part at least to the effect it has on amoebic dysentery which not infrequently exists with, and is overshadowed by, schistosomiasis of the rectum.

It was alleged that antimony salts might have a deleterious effect on the heart.

Antimony salts are eliminated mainly through the mucous membrane of the intestine, and the earliest signs and symptoms of an excessive dose are severe coughing and feeling/

feeling of constriction in the chest, persistent giddiness, repeated and violent vomiting, colic and diarrhoea. Even these symptoms are not an indication for stopping treatment but merely for lowering the dose. When a poisonous dose of an antimony salt is administered all the above signs and symptoms are greatly exaggerated, the pulse is slow and weak, the blood pressure falls, respirations are slow and laboured, depression is marked, collapse sets in and finally death supervenes. The signs and symptoms of chronic poisoning due to the repeated administration of excessive but non-fatal doses are general weakness, depression, headache, giddiness, drowsiness, confusion, indistinct sight, and sometimes diarrhoea. Ultimately fatty degeneration occurs in many of the organs.
In the treatment of schistosomiasis we are dealing with a relatively very small quantity of the medicine, twenty to thirty grains in all, divided into small graduated doses, administered over a period of twenty-eight days. Up to 200 grains have been given to patients suffering from trypanosomiasis without producing any ill effects. There is in fact not the slightest evidence to show that in therapeutic doses antimony salts have any deleterious effect whatsoever on heart muscle.

The theory that antimony salts damage heart muscle rests on faulty clinical observation. It is true/

true that if a given number of patients suffering from schistosomiasis are examined after a course of treatment with antimony salts a proportion are found to have signs of heart disease. But if a similar number of patients are examined before treatment is begun, exactly the same proportion are found to have heart disease already. Furthermore if the trouble is taken to detect before treatment those who already have diseased hearts, it is found that none of the remainder develop signs of heart disease either during treatment or subsequently, whilst those who already have diseased hearts are not made any worse by treatment.

The explanation of the occurrence of heart disease in untreated cases is probably that they suffer from a mild degree of fatty degeneration of the heart, which is very common in Egypt as a result of the anaemia and debility produced by chronic infestation with parasitic worms. Many of the men who break down under the stress of army service would undoubtedly have gone through life in a civil capacity without developing any signs of heart disease. Some break down as recruits, but most of them after two or three years service. It is amongst the latter class men, whose health has gradually declined till they have had to be admitted to hospital, that diseased hearts are most prevalent. Had proper attention been habitually paid/

paid to the condition of these men's hearts on admission nothing would ever have been heard of the alleged damage done to heart muscle by antimony salts.

In order to see if antimony sodium tartarate had any effect on heart muscle, such as was alleged, observations were made on 55 consecutive cases of schistosomiasis found amongst recruits. They were examined before treatment, after they had received 7 grs. and after they had received 19 grs. At each examination the pulse rate was examined before a standard exercise test, which consisted in stepping six times on to a chair, and again after the test, 90 seconds rest being allowed for the pulse rate to return to normal. The presence of mere tachycardia was not regarded as abnormal, because it may be normal to the individual, or a purely nervous phenomenon, or due to drug taking, or very commonly in Egypt, to toxaemia resulting from parasitic worm infestation. But failure of the pulse rate to return, after 90 seconds rest following standard exercise, to approximately the same rate as before standard exercise, was regarded as a manifestation of serious derangement of the heart, in all probability fatty degeneration of the myocardium due to persistence of the toxaemic state referred to above. The 55 cases were therefore divided/

divided into two classes: (a) those with a normal pulse rate or simple tachycardia in whom the pulse rate was approximately the same before and after standard exercise, (b) those with a normal pulse rate, or simple tachycardia, or arrhythmia, in whom there was a difference of more than 10 beats in the pulse rate before and after standard exercise. It is in the latter class if anywhere, amongst the men with hearts already damaged by disease, that one would have expected to find some manifestation of the alleged injurious action of antimony salts on heart muscle.

The results are shown in the following tables:-

TABLE 4.

Average pulse rates of 46 recruits with normal hearts

Before treatment		After receiving 7 grs.		After receiving 19 grs.	
B.E.	A.E.	B.E.	A.E.	B.E.	A.E.
79	81	82	86	79	83

B.E. = Before standard exercise test.
A.E. = After standard exercise test.

Table 4 shows that under the influence of training and treatment practically no discrepancy developed in the pulse rates before and after standard exercise of/

of recruits whose hearts were normal before treatment was begun. A slight increase in both rates was apparent after treatment with 7 grs. and training for 10 days but they had returned to normal by the 25th day, in spite of the fact that the recruits had received another 12 grs. of antimony sodium tartarate and undergone another 15 days training. This slight temporary increase must therefore have been due to the effects of training.

TABLE 5.

Average pulse rates of 9 recruits with abnormal hearts.

Before treatment		After receiving 7 grs.		After receiving 19 grs.	
B.E.	A.E.	B.E.	A.E.	B.E.	A.E.
88	108	99	103	102	108

Table 5 shows the wide average discrepancy found in the pulse rates before and after standard exercise of some 16% of recruits suffering from schistosomiasis who had not yet received treatment or undergone training. After treatment with 7 grs. and training for 10 days the rate before exercise was found to be markedly increased, and, instead of returning to normal, it became, if anything, slightly faster as the result of treatment with another 12 grs., and training for another/

another 15 days. Obviously, in view of the findings in the case of the 46 recruits with normal hearts, this was due to the failure of the damaged hearts to respond to training.

From these observations it is clear that antimony sodium tartarate can be administered with perfect safety to recruits with normal hearts in the doses and at the intervals recommended.

It is also clear that by taking suitable precautions it should be possible in future to eliminate at the final medical examination of recruits all men with abnormal hearts, that is to say all men with hearts liable to break down either as the result of recruit training, or, later in their service, as the result of persistence and aggravation of the symptoms of schistosomiasis coupled with exposure to bad climate and the stress of service.

Further proof of the value and harmlessness of antimony sodium tartarate is furnished by the statistics not yet published, of the Public Health Department of Egypt for 1923, which show that during that year no less than 29,000 patients of all ages and both sexes were treated with it at the four anthelminthic annexes, without the occurrence of a single casualty proved to be due to the medicine. As these patients all attended voluntarily in spite of the fact that the course of treatment/

treatment involves considerable personal inconvenience to the patient, and is somewhat alarming to the uneducated mind, no more convincing proof of the essential efficacy and harmlessness of the medicine could be forthcoming.

It is therefore unreasonable, inhumane and uneconomical to withhold treatment from infested but otherwise healthy recruits on the groundless supposition that their hearts might be damaged by the treatment, especially as we know definitely that if they are not treated many will inevitably be invalided as hopeless wrecks before they have completed five years service.

Another argument advanced against mass treatment was that some cases of schistosomiasis treated with antimony sodium tartarate relapse! This is of course no more an argument against treatment than it would be in the case of quinine and malaria or salvarsan and syphilis. The word relapse moreover conveys an erroneous impression of what usually occurs. If treatment is inadequate, all the worms are not killed and after an interval symptoms reappear; that is a true relapse. But in some cases, in spite of drastic treatment which has resulted in the death of all the worms, patients continue to suffer from severe and intractable signs and symptoms of the disease, especially the rectal form, to which they eventually succumb.

The/

The decisive factor in these cases is not relapse due to survival of the worms, but extensive and irreparable tissue damage.

A consideration of the routine treatment of schistosomiasis followed in Khartoum Military Hospital throws much light on the groundless mistrust of antimony salts which appears to prevail in the Sudan. The patient is given 2½ grains in small doses in hospital and then made to attend for a weekly dose of half a grain till he has had 20 grs. in all. This pusillanimous system has long since been condemned by Christopherson and a host of workers in Egypt as futile. It is widely known that by giving inadequate doses of antimony salts at excessive intervals the worms, far from being killed, are merely stupefied, and, what is worse, gradually accustomed to withstand the medicine till it becomes practically impossible to kill them without jeopardising the patient's life, or at any rate causing the manifestation of serious intestinal symptoms. It cannot be too often or too strongly reiterated that the whole art of curing schistosomiasis consists of saturating the patient and keeping him saturated till all the worms are dead.

It was alleged that antimony salts are not as efficacious against schistosomiasis of the rectum as they are against schistosomiasis of the urinary bladder. This/

This is not the case. It is the serious complications of the former disease that are incurable with antimony salts. They cannot be expected to remove chronic ulcers, polypi, and papillomata of the rectum and large intestine, complications which commonly persist in spite of the death of the worms. It is the sapping of the patient's vitality by haemorrhage and the poisoning of his system by septic absorption that constitute the serious feature in cases of advanced rectal schistosomiasis. In selected cases removal of the large intestine might conceivably benefit the sufferer.

Another argument advanced against mass treatment was the fact that in the month following that in which mass treatment of recruits was begun, an unusually large number of men had been invalided from the Egyptian Army General Hospital, Cairo. To this I replied that the fact that it had been found necessary in that month to invalid a large number of men whose disease had not been diagnosed when they entered the army some years previously, and whose health had steadily deteriorated till it had passed beyond medical aid, far from being an argument against a system of which they had never had the benefit, was the strongest possible argument in favour of it. No amount of argument, especially of the specious sort which tries

to/

to foist the failures of a broken down system on to a struggling new one, can ever justify the policy of standing idly by till diseased men have become so seriously ill as to require admission to hospital and then, after some of them have already reached the incurable stage, undertaking their treatment. Even if all the men referred to had been recruits, which was not the case, it would still have been possible to maintain on grounds of humanity, economy, and efficiency that they were better invalided as recruits in the same condition that they were in when they joined the army, than as serving soldiers, broken in health, and therefore no longer able to earn a livelihood.

It was alleged as an argument against treatment that treated men would become reinfested on furlough. Reinfestation will no doubt occur occasionally, but that is no reason for entertaining an exaggerated idea of its danger. When due consideration is given to the fact that it has taken 21 years of life and work as fellahin for 50% of recruits to become infested, it becomes apparent that the percentage of serving soldiers likely to become infested during a total of 75 days furlough in 5 years service will be so extremely small as to be negligible. If progressive infestation did occur to any serious extent during service one would expect to find a higher percentage of infested men amongst serving soldiers than amongst recruits/

recruits but the reverse is the case, the figures being 40% and 49% respectively, the difference no doubt being due to treatment and invaliding of serving soldiers. The soldier on furlough does not work as a fellah; he leads for a brief spell the lordly life of an idle and opulent man. In any case the danger of reinfestation is not an argument against the treatment of schistosomiasis any more than it would be in the case of malaria or venereal disease.

11. THE EXACT EXTENT OF PARASITIC WORM INFESTATION IN THE EGYPTIAN ARMY.

Attention was next directed to recruits for the army and to serving soldiers. All recruits of the 1923 winter call and all the serving soldiers in Cairo, comprising His Majesty's Household troops, detachments of Cavalry and Artillery, and the 2nd, 4th and 8th Battalions were systematically examined between the 4th of October 1923 and the 10th of February 1924. The results are shown in the following tables:-

TABLE 6/

TABLE 6.

Examination of the 1923 winter call of recruits for the Egyptian Army.

	Number Examined	Ankylostomiasis		Schistosomiasis of urinary bladder		Schistosomiasis of Rectum.		Other Infestations		Infested.	
		No.	%	No.	%	No.	%	No.	%	No.	%
Recruits	1264	745	59	619	49	2	0.3	79	6.2	959	75.9

TABLE 7.

Examination of soldiers of the Egyptian Army serving in Cairo.

Unit	Number examined	Ankylostomiasis		Schistosomiasis of urinary bladder		Schistosomiasis of Rectum.		Other Infestations		Infested	
		No.	%	No.	%	No.	%	No.	%	No.	%
Household Troops	438	159	36.5	151	34.5	1	0.2	8	1.8	253	57.7
Cavalry	128	50	39.0	44	35.2	-	-	2	1.5	78	61.0
Artillery	200	137	68.5	66	33.0	-	-	1	0.5	151	78.5
2nd Batt^{n}.	534	198	37.0	190	35.5	7	1.3	8	1.5	319	59.8
4th "	465	304	65.4	218	46.9	13	2.8	30	6.4	383	82.4
8th "	587	279	45.8	277	45.3	2	0.3	38	6.4	420	71.6
Total	2352	1127	47.9	946	40.2	23	1.0	87	3.7	1604	68.1

Thus it is seen that 76% of recruits and 68% of soldiers with from one to four years service were found to be suffering from one or more, in some cases four, kinds of parasitic worm infestation. As large numbers of men are being treated or invalided every year for these diseases it is manifestly absurd to ascribe the difference in percentage to natural cure.

Variations in the percentage of infested men in different units depend upon the areas from which the majority of recruits in these units were drawn. Thus it will be seen in Table 7 that 2.8% of the men in the 4th Battalion have rectal schistosomiasis, a much higher proportion than any other unit examined; this is due to the fact that the 4th Battalion contains a relatively large proportion of men from the Fayoum Province, an oasis to the west of Egypt, in which rectal schistosomiasis is much more prevalent than anywhere else in the country. Again both the 4th and the 8th Battalions have a higher percentage of men with schistosomiasis of the urinary bladder than any other units examined; this is because the majority of the men in these two battalions are drawn from the delta area (Lower Egypt) in which this form of the disease is much more prevalent than in the valley area, (Upper Egypt).

It seemed advisable to push the investigation one step further by examining the 98 officer cadets in the Military School, Cairo, and the 52 medical students from Kasr el Aini hospital seeking medical education at Government expense with a view to serving subsequently in the Medical Corps. The result is shown in Table 7:-

TABLE 7.

Examination of Officer Cadets in the Cairo Military School.

Number examined	Ankylostomiasis		Schistosomiasis of urinary bladder.		Other Infestations (chiefly Taenia Nana)		Infested.	
	No.	%	No.	%	No.	%	No.	%
150	5	3.5	20	13.3	6	4	31	20.6

20.6% of these boys, who came from relatively good social surroundings, were thus found to be infested. Before the examination was carried out they were all asked if they had "bilharzia", and all denied it. After the examination those found to have schistosomiasis of the urinary bladder all admitted that they knew they had the disease, and in every case they were able to state the year in which they contracted it, and were even able to associate infestation with bathing in particular canals whilst staying in/

in the country. The infestations were all light. It is interesting to note that renal colic, with atypical symptoms is a fairly common complaint amongst Egyptian officers and men. Genuine cases of course also occur, due to the presence of stone in the kidney. But the atypical cases I believe to be due to the passage of stray ova into the ureters.

12. SUMMARY OF WORK CARRIED OUT IN THE ANTHELMINTHIC ANNEXE OF THE EGYPTIAN ARMY GENERAL HOSPITAL, CAIRO, BETWEEN OCTOBER 1923 AND FEBRUARY 1924.

1445 recruits suffering from schistosomiasis, ankylostomiasis, and other intestinal infestations, and 1214 serving soldiers suffering from ankylostomiasis and other intestinal infestations received appropriate treatment, whilst 969 serving soldiers found to be suffering from schistosomiasis had their names noted for treatment in March 1924 on the conclusion of the winter training season.

3756 men were examined, involving the microscopical examination of 8128 specimens of urine and faeces.

2038 doses of carbon tetrachloride were administered.

621 men were treated for schistosomiasis, involving the administration of 7450 intravenous injections of antimony sodium tartarate.

The staff consisted of a portion of the existing staff of the Egyptian Army General Hospital, Cairo, namely, myself, El Yuzbashi (Captain) Ibrahim Effendi Rizk, and 3 anfar (privates) of the Egyptian Army Medical Corps.

Before I left Egypt in March very encouraging reports were being received from officers commanding units and medical officers doing duty with troops. The gist of these was that whereas in previous years numbers of recruits used to faint on parade and several had usually to be admitted to hospital for schistosomiasis before their training was complete, this year none at all had fainted or reported sick with schistosomiasis, a result which they unanimously attributed to the introduction of mass diagnosis and treatment. All were most anxious that the work should continue.

The cost was well under the original estimate of £50.

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13. PLANS FOR THE FUTURE.

This practical confirmation of the value to the army of organized anthelminthic work removed the last shadow of doubt from my mind, so I proceeded to elaborate plans for putting the work on a permanent basis.

Hitherto the work had been carried out in a few ramshackle buildings devoid of water supply, and insufficiently protected from the heat in summer and the cold in winter. Conservancy requirements were met by a bucket latrine which was unprotected from flies. Finally men under observation after treatment were housed in tents.

I pointed out that these conditions were all very well for the preliminary experiment, but that if the work were to be continued permanent arrangements would have to be made, if possible before the summer call of recruits in March 1924. My experience in organizing the Wadi Halfa Quarantine and this anthelminthic annexe had convinced me of the value in this sort of work, both of a highly organized routine and of a specially adapted building in which to carry it out. I further pointed out that the staff working under high pressure had had to contend in winter with many difficulties and discomforts, all of which would be greatly increased in summer, and that it was unreasonable/

unreasonable to expect them to put up with these conditions indefinitely.

I therefore prepared plans for an anthelminthic block (figs. 31 and 32), a latrine, and a barrack room for the protection of men under observation after treatment.

The entrance to the anthelminthic block is by D3, across a part of the verandah which is enclosed by fly proof netting. The doors D2 leading into the reception office, D1 leading into the collecting and preparation room, and D2 leading back to the open part of the verandah are all hung with fly proof netting. The object of this arrangement is to trap the flies which recruits bring with them in swarms from their villages. The majority of the flies would leave them as soon as they entered the shade of the verandah, and the rest when they entered the reception room. The flies left in these two places would be trapped daily by any of the well known methods.

Recruits on entering the reception room would have their names and other data entered on the special form (fig. 16). They would next pass into the room for the collection of faeces and urine and the preparation of faecal emulsions, and from this room to the open verandah. In the meantime the nominal rolls and the prepared specimens would be passed through the sliding hatch into the laboratory. The results

of/

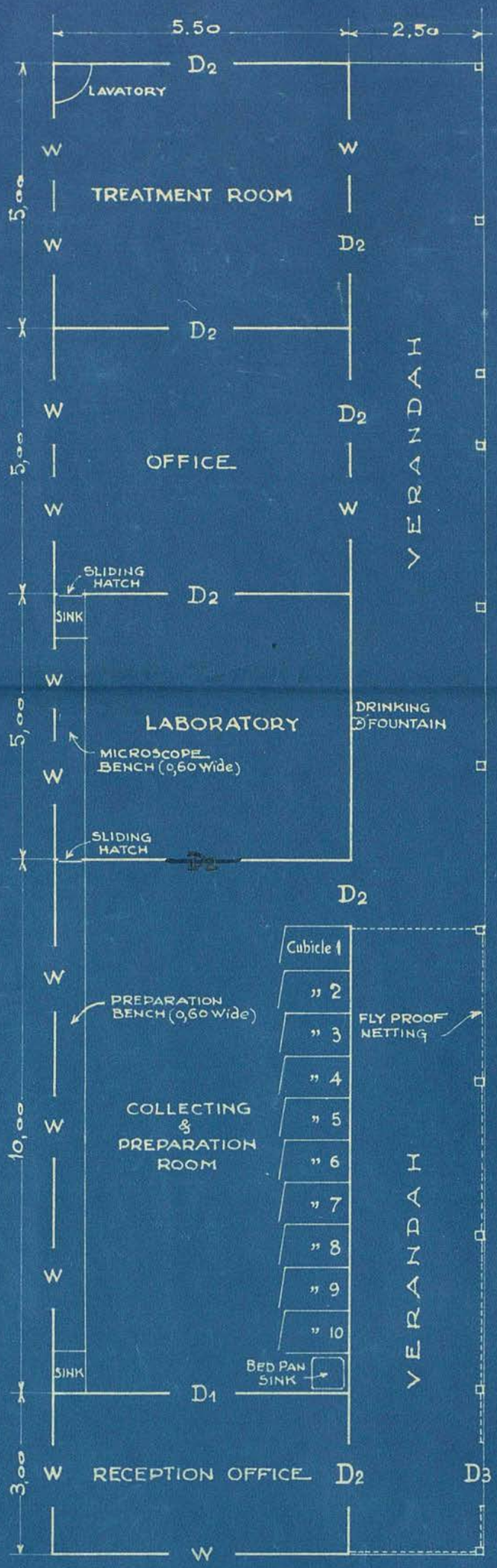
ANTI-HELMINTH BLOCK

875

LINE PLAN

ANTI-HELMINTH BLOCK

SCALE = 1:100



NOTE

The room dimensions shewn are internal.

fig 31

ANTI- HELMINTH
BLOCK
880

Fig. 32

SECTION THROUGH PREPARATION ROOM

SCALE = 1: 50

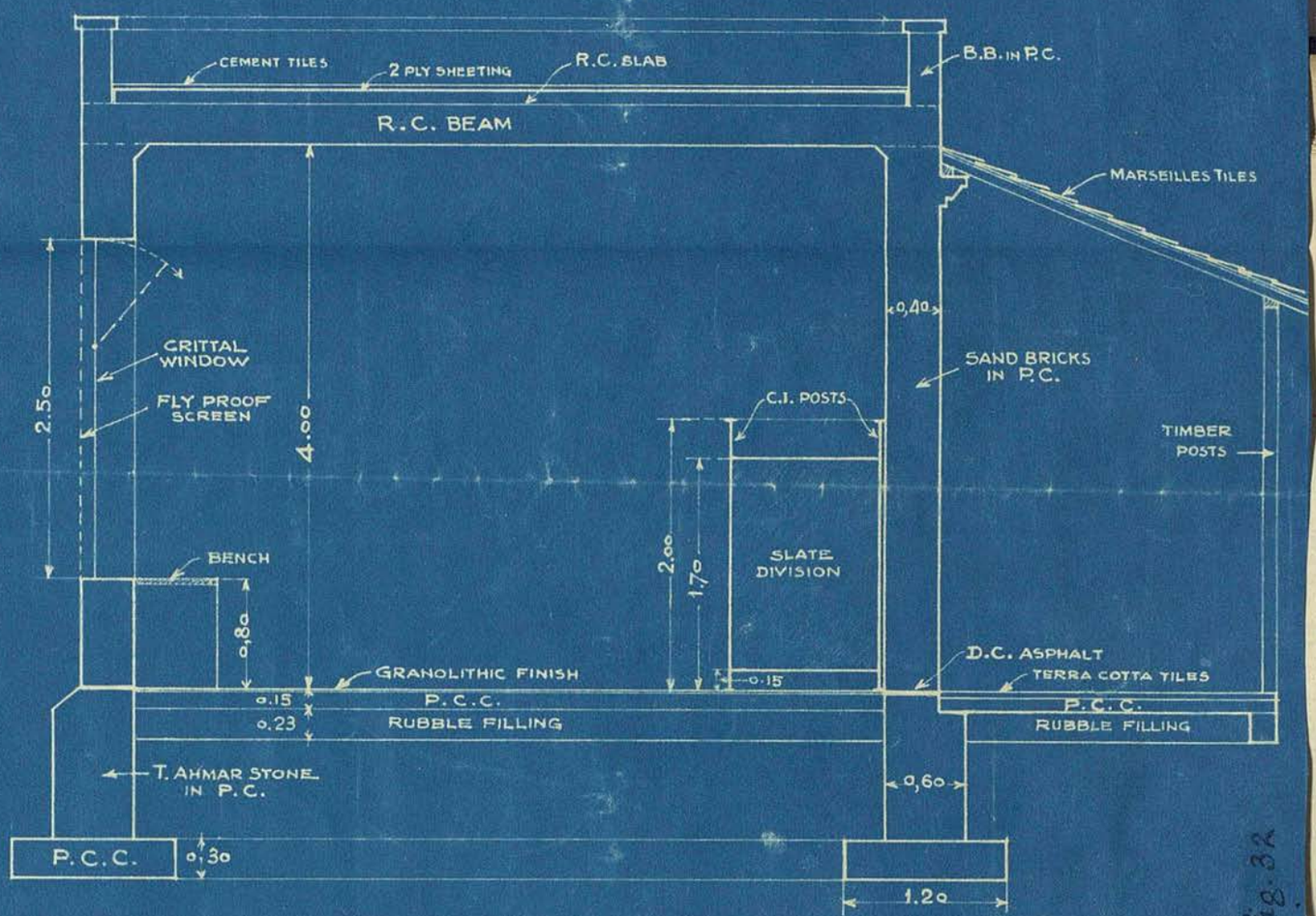


Fig. 32.

of the examination would be entered on the forms, which would then be passed through the other sliding hatch into the office, where the appropriate index cards would be prepared. Men with ankylostomiasis and other intestinal infestations would then be passed through the office into the treatment room where they would receive their dose and pass out through the door at the end of the building, proceeding thence to the observation block. Men with schistosomiasis would be given instructions as to attendance for treatment. Men attending for treatment for schistosomiasis would be lined up on the verandah, passed through the office, where their names would be checked by the index cards, thence into the treatment room, where they would receive their intravenous injections, and so out through the end door to the observation block, where they would lie down for two hours. Injections would be recorded on the index cards together with any signs or symptoms noted during the observation period.

In such a building 1 medical officer assisted by 3 men could rapidly, comfortably and safely carry out the daily examination of 100 urines and 100 faeces, treat all ankylostomiasis carriers detected, give up to 300 intravenous injections to schistosomiasis carriers attending for treatment, and perform the ancillary clerical work.

The/

The estimated cost of such a building is £1370.

A latrine and urinal, connected to the Cairo drainage system, for the use of men under observation and treatment, would cost £300.

Accommodation for 200 men under observation and treatment could be provided either by tents, huts, or permanent buildings. As the service would be a permanent one the latter would seem to be the most economical in the long run, as they would certainly be the most satisfactory, from the point of view of convenience as well as of protection from the cold wind in winter and the hot sun in summer. The most suitable form would be two parallel barrack rooms connected by a common verandah, each room to hold two rows of 50 beds each. Such a building would cost about £4000.

Thus a sum of £6000 would serve to put the work on a satisfactory and permanent basis, not a very large amount to ask for, all things considered, especially at a time when the Public Health Department of Egypt is spending £9000 a year on anthelminthic work alone, and is constantly increasing its commitments in this respect.

His Excellency Mahmud Pasha Azmi, Minister for War and Marine, who from first to last had taken the keenest personal interest in this work, actually had the/

the money available for immediate expenditure in this service. Unfortunately at this juncture obstruction, emanating from the same quarter as the arguments already disposed of in this thesis, once more declared its presence and decreed that nothing should be done, on the ground that the cost was too high in relation to the benefits to be gained! The humanitarian side of the question was not even referred to. The adoption of this attitude was all the more inexplicable in view of the fact that there was absolutely no financial objection to the expenditure of the required sum.

This decision would no doubt have been overridden by the Minister on account of his personal views on the whole question, in which he had the support of the King, but unfortunately before anything could be done the Yehia Ministry went out of office, and with it a Minister whose keenness in matters affecting the public health made him a shining light in Egypt.

One can only express the pious hope that better counsels will prevail, and that in time an edifice will arise worthy of the foundation that has been laid for it. It is a significant fact that the Public Health Department of Egypt has already grasped the ~~immune~~ immense potential value to the country of scattering to its confines every year some three or four thousand ex-soldiers,/

ex-soldiers, most of whom know what it is to have suffered from parasitic worm infestation, and to have been cured of it. The Public Health Department proposes further to increase their value from the propaganda point of view by giving them all a short course of instruction on the nature, mode of spread and methods of protection against the chief forms of parasitic worm infestation.

14. C O N C L U S I O N S.

1. 14% of the soldiers treated in the Egyptian Army General Hospital, Cairo, in 1923 were admitted primarily for parasitic worm infestation.

2. 29% of the men invalided in 1923 from the same hospital were invalided for the effects of chronic infestation with parasitic worms.

3. Large numbers of "fit" men in the Egyptian Army suffer constantly from signs and symptoms of parasitic worm infestation without feeling ill enough to report sick.

4. The Egyptian soldier is notoriously lacking in resistance to the adversities of military service in a bad climate. There is every reason to believe that this is the direct result of his con-/

constitution having been undermined by chronic infestation with parasitic worms.

5. 91% of a batch of 292 recruits for the Police School, Abbassia, Egypt, were found to be infested with parasitic worms, some harbouring as many as four kinds. 73% had ankylostomiasis, 52% schistosomiasis, 7% ascariasis, and 3% other infestations.

6. The 212 ankylostomiasis cases were treated with a single dose of 5 cc. of carbon tetrachloride. 3 months later 79% were found to have been completely cured. For efficacy, ease of administration, mildness of after effects, safety and cheapness carbon tetrachloride is incomparably the best anthelminthic yet discovered for the treatment of ankylostomiasis amongst Egyptians.

7. The 152 schistosomiasis cases were treated with 21 grs. of antimony sodium tartarate divided into 12 doses given by intravenous injections given on alternate days. Of the 132 who were available for re-examination 3 months later, 95% were found to have been completely cured. By amplifying the dose on the lines indicated it is probable that 100% of cures could be obtained in these comparatively lightly infested healthy/

healthy looking recruits. Cure depends upon finding the limit of saturation the patient can tolerate and maintaining it till all the worms are dead. Antimony sodium tartarate merely kills the worms; it cannot be expected to repair hopelessly damaged tissues.

8. Of a batch of 55 recruits 46 with normal hearts suffered no harm from a full course of antimony sodium tartarate, and underwent training during their course of treatment. 9 who showed evidence of more or less serious derangement of the heart became worse in spite of treatment. As they were also undergoing training the presumption is that the progressive failure of these already deranged hearts was due to the effects of training, and not of the medicine.

The derangement of the heart found in 16% of recruits is probably the outcome of chronic toxaemia; one would expect such hearts to exhibit some degree of fatty degeneration post-mortem.

9. The hearts of all recruits should be subjected to a simple exercise test. Recruits whose hearts show signs of derangement should be rejected.

10./

10. 76% of the 1923 winter call of recruits for the army, picked fellahin with every superficial appearance of perfect health, were found to be suffering from parasitic worm infestation, 59% having ankylostomiasis and 40% schistosomiasis.

11. 68% of soldiers serving in Cairo were found to be harbouring parasitic worms, 59% having ankylostomiasis and 40% schistosomiasis.

12. 21% of officer cadets were found to be suffering from parasitic worm infestation, 3% having ankylostomiasis and 13% schistosomiasis.

13. Treatment of these men, ~~was~~ carried out as far as possible immediately after diagnosis, resulted in a very high percentage of cures.

14. A complete case has been made out on grounds of expediency no less than of humanity for the immediate application of the methods of mass diagnosis and treatment to the rest of the Egyptian Army, and for the routine examination and treatment of all recruits in future, before they join their units, on the lines indicated in this Thesis.
